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MCMMASTER UNIVERSITY PRE-BUDGET SUBMISSION TO THE
HOUSE OF COMMONS STANDING COMMITTEE ON FINANCE

Introduction

McMaster University is supportive of the Pre-Budget submissions presented by the Council of Ontario Universities and the Association of Universities and Colleges of Canada. These submissions highlight the critically important role of universities in elevating Canada's stature as an intellectual powerhouse, and in nurturing skills through study and research that will better position this country for the economic realities we face and challenges that we must confront. Individually and together, advances made in universities are addressing the most urgent needs in our society, improving our quality of life, our productivity, and developing opportunities for communities across our country and around the world.

McMaster University, located in Hamilton, Ontario, is one of Canada's most research-intensive universities, with an annual research income of over \$395 million. Institutions like ours have a particular opportunity and responsibility to engage in economic and social development in our communities. Our traditional mandate of education, research and service is enhanced by our focused development of university-industry partnerships, spin-off companies and knowledge transfer, supported by a full range of incubator and technology transfer facilities.

At McMaster we appreciate the immense challenges that lie ahead for the government relating to Canada's economic recovery. As the Government of Canada develops Budget 2012, McMaster University supports continued vigilance and focused strategic spending in areas that can improve our competitiveness by supporting innovation.

This paper highlights four specific areas where there is tremendous opportunity for Canada to be a world leader and we offer specific opportunities for targeted investment. These include:

- Health: Infectious Diseases and Optimal Aging
- Technology: Energy (Nuclear Research and Training and Smart Grid Technology) and the Digital Economy

1. Infectious Diseases

The Opportunity

Infectious diseases are the world's most common killers of children and the elderly. They kill over 13 million people a year and account for one in two deaths in developing countries. Furthermore, the current arsenal of antibiotics that we rely on to curb the impact of infection is substantially eroded by the development and spread of resistance.

These staggering statistics from the World Health Organization emphasize the need for action. As public awareness grows of the threat of undefeated infectious diseases, governments, scientists and health-care workers have turned their attention to understanding and combating this complex problem both at home and abroad.

McMaster Contribution/Expertise

At McMaster University, the Michael G. DeGroot Institute for Infectious Disease Research (IIDR) is making a substantial impact with a combination of transdisciplinary experts and state-of-the-art equipment and facilities. Through advances in antimicrobial drug discovery and diagnostics, host and pathogen biology, population dynamics and clinical research, the institute is making significant improvements to public health in Canada and around the globe.

As well, McMaster hosts one of the few university fully-accredited vaccine production facilities, along with a world-leading drug discovery platform. Together these facilities have had significant success in developing vaccines and new drug leads for infectious diseases such as tuberculosis, and overcoming antibiotic resistance. These facilities enable a rapid response capable of addressing sudden outbreaks of infectious diseases such as SARS.

The IIDR is now in a position, with its depth of expertise, capacity and vision, to develop drugs and vaccines for key areas including: infectious diseases in children and the elderly, emerging infectious diseases and overcoming antibiotic resistance. There is no other comparable facility in Canada that can undertake the type of work that happens at the IIDR. With a focused effort, the IIDR can address this top health challenge of the next millennium.

Our Recommendation

We propose the establishment of an initiative in new antimicrobial therapeutics. This initiative will gather together a multidisciplinary group spanning the clinical, biomedical and engineering sciences to bring novel drugs, diagnostics and vaccines to the clinic to address the critical challenges

associated with antibiotic resistance and infection in our most vulnerable communities. This initiative will achieve the following: translation of research to the private sector and the clinic and a better understanding of the increasing resistance in antibiotics to treat bacterial infection. This will save and enhance the lives of our most vulnerable populations, fight sudden or emergent infectious disease outbreaks, and promote innovative research that will benefit Canadians and the international community-at-large. We would suggest focused investment which would enable initiatives like the one proposed at McMaster to proceed and ensure Canada is a world leader.

2. Optimal Aging Initiative

The Opportunity

The facts pertaining to aging in Canada are sobering. Within 25 years the proportion of seniors will grow from the current 13 to 25 per cent and the number of Canadians 65 and older will grow from 4.2 million to 9.8 million. To address this significant demographic shift, healthy aging must be at the forefront of the social policy agenda.

Helping older Canadians live a better quality of life, supporting their contributions to our communities, reducing inequities, and enabling older Canadians to make positive healthy choices to enhance their independence are all important goals which the government has set. To achieve these objectives, we need to develop a better understanding of the aging process and increase the focus on health promotion and disease management. This will also provide an effective way to manage expected health system pressures.

McMaster Contribution/Expertise

Although the numbers may seem daunting, the demographic trend presents an excellent opportunity for McMaster researchers to capitalize on their established successes and to create new avenues in the diverse aspects of aging research and knowledge translation. The physical, social, economic and biological components all hold tremendous potential for new discoveries and ideas that will inform and transform aging for this generation and generations to come.

McMaster's scientists focus on the biology of aging through research in population genomics, microbiology and immunology and the university is home to the comprehensive Canadian Longitudinal Study in Aging. McMaster researchers concentrate on the interactions between physical, social and psychological factors through applied research at its School of Rehabilitation Science, Gilbrea Centre for Studies in Aging and its Population Health Research Institute. To inform, engage and make change, the McMaster Health Forum brings together policy makers, health providers and citizens for meaningful dialogue to address the health challenges of tomorrow.

With these initiatives in place, McMaster is ready to be the authoritative voice on aging for Canada. Our goal is to provide individuals interacting with the health system with the detailed information they need through a multi-media platform using current and emerging technologies. The initial and most visible outcome would be the creation and implementation of a comprehensive web-based knowledge service. It would provide Canadians with a readily-accessible, interactive and user-friendly location of complete information and advice for the older adult, their families and caregivers on all aspects of optimal aging.

Our Recommendation

We would recommend the establishment of a Canadian Optimal Aging Initiative. This initiative must be an interdisciplinary enterprise, bringing together the latest research and developments for seniors, creating synergy among health researchers and caregivers across the country. This initiative would capitalize on research and healthy aging initiatives and will, ultimately, result in better health for Canadians and others worldwide.

3. A) Energy - Nuclear Research & Training: Chalk River Laboratories

The Opportunity

For Canada to expand its nuclear capacity over the next decade and continue as a leader in nuclear research and technology, it must ensure it is at the leading edge of research, development, scholarship and training. With the recent changes at AECL, this is the opportune time to create a structure at the Chalk River Laboratories where industry, government, and academia can work together to create new discoveries, develop new and improved technologies and train the future workforce.

McMaster Contribution/Expertise

McMaster University is Canada's nuclear university. With more than 50 years of excellence in nuclear research, teaching and training, our reactor remains relevant to the priorities of Canada – training of highly qualified people (HQP) for nuclear expansion and healthcare; flexible, reliable and longer life medical isotope supply; and supporting leading edge research into new medical applications of radioisotopes in imaging therapy for early detection and improved treatments.

Our Recommendation

The creation of a national nuclear sciences and engineering strategy that strongly links university-led research, education and development with Chalk River Laboratories. We believe it is important for Canada to have a country-wide network of nuclear research and education centres that link the private sector with government laboratories and academic partners – with a focus on universities, so that the full breadth of research and education, from curiosity to application, from the apprentice to the PhD, is included in the nuclear sciences and engineering strategy.

This strategy should be broad in focus and include: research into advanced reactor safety, protection of people and the environment, applications of isotopes and radiation for the diagnosis and treatment of diseases, development of integrated sustainable energy programs, and the creation of evidence-based energy policy. Further research in this broad definition of nuclear research will contribute, through innovation, to the economy of Canada, while protecting our country's natural environment and improving the health of Canadians. Education is a key component of this strategy, as we need to create workers for this new «nuclear knowledge» economy.

The status of Chalk River Laboratories, that is, whether in future it is a crown corporation, or a government laboratory, has major implications for the funding of university applications for collaborative research at Chalk River. We recommend that models of the costs of research, and projections of revenue, be developed with an understanding of the levels of funding of university partners. Similarly, we must address the challenges and opportunities for hosting undergraduate and graduate students to ensure we provide better access to unique research and education resources for Canadian students.

3. B) Energy - Smart Grid Technology Centre

The Opportunity

The government has recognized that renewable technologies are an integral component of our energy future. A smart grid delivers electricity from suppliers to consumers using two-way digital technology employing sensors, monitoring, communications, automation and computers to improve the flexibility, security, reliability, efficiency and safety of the electrical system.

The accelerated pace of developments in renewable energy, local and global environmental pressures, and major shifts in transportation trends (both personal and public transportation) will place increased demands on our electrical system and put the effective management of the smart grid at the centre of our economic prosperity and social wellbeing.

Now is the time to invest in research into advanced monitoring, controls, cognitive energy systems and advanced safety critical software, all of which are essential for the complex characteristics of the modern grid.

McMaster Expertise/Contribution

McMaster University has the intellectual resources and laboratory infrastructure to make significant contributions to these research complexities, with additional expertise in the new nanotechnology, battery technologies and super capacitors needed to meet the demanding storage requirements of the smart grid. We are also able to leverage our existing resources including:

- The McMaster Automotive Resource Centre (MARC) – 80,000 SF of leading edge industrial labs focusing on clean automotive technologies which recently had an \$11.5 million injection from FedDev. MARC is providing the much-needed space to work with our industry partners and attract new partners both in the private and public sector to conduct applied research and train personnel needed by industry
- Our established partnerships with industries heavily involved in energy R&D including: IBM, Ford, GM and ArcelorMittal Dofasco
- Our Canada Excellence Research Chair in Hybrid Powertrain and an NSERC/Ford Industrial Research Chair
- Significant funding from Automotive Partnership Canada (APC)
- We are also focusing on new and innovative green building technologies and the development of a living lab on campus that would serve as both a research and teaching tool for the smart grid-enabled buildings of the future.
- A critical mass of talent and leading edge facilities to attract and recruit international, world-class scientists

Our Recommendation

We recommend establishing a world-class technology centre focused on the smart grid to complement and connect existing programs like ours with those of utilities and industry. This centre will strengthen Canada's research capacity in a globally strategic market; it will develop innovative techniques for connecting renewable technologies to the grid and for managing new loads (such as Plug-in HEVs) with security and reliability; it will train

highly qualified people, create jobs and positively impact the region's economy (job creation, clean energy). It will also help the Government meet its goals of contributing to strategic, large-scale research and development (R&D) projects in the automotive sector that support innovative, greener and more fuel-efficient vehicles.

In order to facilitate and support an industry-academic research collaboration in this area we would recommend consideration of the Fraunhofer model. The Fraunhofer institutes are customer-oriented, applied research institutes that strive to transform scientific findings into useful innovations and have achieved significant success.

4. Digital Economy

The Opportunity

Digital technologies are critical to every aspect of our society and have revolutionized the way Canadians live, work and play. Canada needs to regain its role as a leader in the digital economy and a strong national strategy will ensure that our country reaps the social and economic benefits that come with the aggressive development and adoption of new technologies.

McMaster's Expertise/Contribution

Technology decisions are fundamentally changing the nature of our society, opening Canada's borders to the world and completing the transformation of our country into a knowledge-based economy and society. McMaster University is participating in this change process by being at the forefront of teaching, scholarship and research in the digital media/economy fields.

Our leading research has had a major impact on the development, design and use of digital technologies and infrastructure. We are graduating a digitally skilled workforce who contribute to the success of the ITC sector. We are using new technologies that advance student learning through digital content and we are providing our discoveries on-line to local, regional, national and international business/communities.

Our Recommendation

In order to enhance Canada's innovation and productivity capacity in the digital economy, we recommend:

- The establishment of a new National Centre of Excellence (NCE) in Digital Economy. The Network would comprise four to five principal nodes, each focusing on a key area of research (i.e. health informatics, policy and security, and interactive digital media). Ideally, the health informatics node would be located in Southern Ontario to capitalize on the research capabilities of this area's educational institutions. This is another area where the Fraunhofer model could help to facilitate and support an industry – academic research collaboration using research grants for advanced work well ahead of the marketplace but identified as potentially important to client companies.
- Building on the federal government initiatives in Science & Technology, we further propose that new special Canada Research Chairs (CRC) and Centres of Commercialization and Research (CCR) be created and dedicated to this initiative.
- This proposal is aimed at significantly increasing Canada's capacity to produce highly qualified people essential for the digital economy and enhancing the nation's capacity in innovation and creativity.
- The proposed NCE would have an annual budget of \$10 million for a 7-year period, renewable.

Summary

As one of Canada's top research universities, McMaster remains committed to innovation and to keeping Canada's industries among the most competitive in the world. We believe that with strengthened and focused investment in infectious disease research, optimal aging, nuclear research and training, smart grid technology and the digital economy, Canada can maintain its strength in established programs and unleash new opportunities for international leadership in areas of critical importance to the Government and Canada.

We appreciate this government's strong support for research and development. We are also aligned with the government's expectation that effective and coordinated investment in R&D activities and infrastructure, highly qualified personnel development, innovation support and R&D commercialization must take place to ensure Canada's continued leadership position.

It has never been more important, than in this economic climate, to capitalize on the research knowledge gained in Canada's universities to ensure economic prosperity for our region, our province and our country.